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| 10/664,665      | 09/18/2003  | Akram Ali Salman     | 2000.111200         | 4618             |

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EXAMINER

SCHILLINGER, LAURA M

ART UNIT PAPER NUMBER

2813

DATE MAILED: 08/24/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/664,665

Applicant(s)

SALMAN ET AL.

Examiner

Laura M. Schillinger

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☐ Responsive to communication(s) filed on 23 March 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-84 is/are pending in the application.
- 4a) Of the above claim(s) 19-84 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 and 18 is/are rejected.
- 7) ☒ Claim(s) 17 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Claim Objections*

Claim 17 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-16 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lin ('729) as applied to claim 1, and further in view of Niino et al ('790).

Lin teaches the following claimed limitations as cited below :

1. A method, comprising:

providing a device having a dielectric layer (Col.2, lines: 38-46);

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applying a plurality of voltage pulses to said device (Col.2, lines: 45-50); and  
determining a time-to-breakdown for said dielectric layer based a count of the number of pulses  
applied to said device to break down said dielectric (Col.3, lines: 1-5).

However, Lin fails to teach Applicant's amended claim limitation wherein each of the voltage  
pulses are at the same voltage level.

Niino teaches a voltage pulse at the same voltage level as claimed by the Applicant (Col.11,  
lines: 15-25).

It would have been obvious to one of ordinary skill in the art at the time the invention was made  
to modify Lin to further include a constant voltage pulse as taught by Niino because as Niino  
teaches, a constant voltage pulse or a pulsating voltage having a changing level may be used to  
determine dielectric breakdown (Col.11, lines: 15-25).

2. The method of claim 1, further comprising measuring a current through said dielectric layer  
after one or more of said constant voltage pulses has been applied (Col.2, lines: 45-51).

3. The method of claim 1, further comprising measuring a current through said dielectric layer  
after each of said plurality of constant voltage pulses has been applied (Col.2, lines: 45-51).

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4. The method of claim 1, wherein said time-to-breakdown is determined based upon a measurement of current flowing through said dielectric layer, said current being measured after one or more of said constant voltage pulses has been applied (Col.3, lines: 1-6).

5. The method of claim 1, wherein said device is comprised of at least one of a transistor, a capacitor, a resistor and a memory cell (Col.1, line: 30).

6. The method of claim 1, wherein said dielectric layer is comprised of silicon dioxide or a material having a dielectric constant greater than 5 (Col.3, line: 41-gate oxide).

The method of claim 1, wherein said constant voltage pulses have a voltage that ranges from approximately 4-5 volts (Col.2, lines: 50-60).

The method of claim 1, wherein said pulses have a constant pulse width (Fig.4- note that the pulse width of the current are shown to have a constant width and due to the ( $V=IR$ )- the voltage would necessarily also have a constant pulse width).

9. The method of claim 1, wherein said pulses have a constant pulse width of less than 1 usec (Col.2, lines: 60-65).

10. The method of claim 1, wherein said pulses have a constant pulse width of approximately 100 ns (Col.2, lines: 60-65).

11. The method of claim 2 or 3, wherein said step of measuring said current through said dielectric layer is performed using an applied voltage of approximately 1-2 volts (Col.2, lines: 50-60).

12. The method of claim 1, wherein said device is a transistor and said dielectric layer is a gate insulation layer for said transistor (Col.2, lines: 35-45).

13. The method of claim 1, wherein said dielectric layer is an interlevel or intralevel dielectric layer of a conductive interconnection structure (Col.2, lines: 35-45- a gate oxide is considered an interlevel dielectric).

14. The method of claim 1, further comprising: determining at least one parameter of a process operation to be performed to form a dielectric layer on at least one subsequently processed substrate based upon said determined time-to-breakdown (Col.3, lines: 8-17).

15. The method of claim 14, further comprising: performing said process operation comprised of said determined at least one parameter on said at least one subsequently processed substrate to form said dielectric layer above said at least one subsequently processed substrate (Col.3, lines: 8-17).

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16. The method of claim 14, wherein determining said at least one parameter comprises determining at least one of a temperature, a pressure, a duration, a process gas composition, a process gas concentration, and an applied voltage of said at least one process operation (Col.3, lines: 8-17- applied voltage).

18. The method of claim 1, wherein said device is part of a test structure formed on a semiconducting substrate (Col.4, lines: 10-15).

#### ***Allowable Subject Matter***

The following is a statement of reasons for the indication of allowable subject matter:

In reference to claim 17, prior art of record fails to teach the limitations of claim 14 in combination with the limitation of claim 17 wherein at least one process operation comprises at least one of a deposition process, a thermal growth process and a nitridation process.

Consequently, claim 17 contains allowable subject matter.

#### ***Response to Arguments***

Applicant's arguments with respect to claims 1-16 and 18 have been considered but are moot in view of the new ground(s) of rejection.

#### ***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

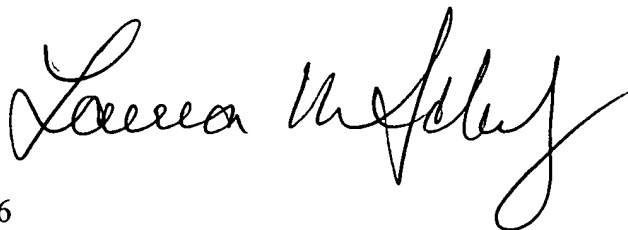
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Laura M. Schillinger whose telephone number is (571) 272-1697. The examiner can normally be reached on M-T, R-F 7:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl W. Whitehead, Jr. can be reached on (571) 272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read "Laura M Schillinger", with a stylized, flowing script.

Laura M Schillinger  
Primary Examiner  
Art Unit 2813

8/15/06